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鈦合金無縫管間接擠製加工成形性之分析

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摘要

本文使用剛塑性有限元素模擬軟體 DEFORM 3D，研究鈦合金胚料穿過單孔穴無縫管間接擠製，其中母模、心軸與盛錠筒設為剛體，且不考慮擠製過程的溫度變化。本研究進行一系列的模擬分析，其模擬擠製條件包含摩擦因子、母模進給速度、胚料溫度與管件厚度等；預測擠製過程中鈦合金胚料之破壞因子分佈、應力應變分佈、模具負荷大小及擠製成品外觀等。模擬分析結果希望能確認有限元素軟體對鈦合金無縫管間接擠製加工成形性之適用性。

關鍵字: 有限元素;鈦合金;無縫管間接擠製

Forming Analysis of Titanium Alloy Using Indirect Extrusion Processes of Seamless Tube

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Abstract

This paper employs rigid-plastic finite element DEFORM 3D software to investigate the plastic deformation behavior of a titanium alloy during its indirect extrusion through single-hole die of seamless tube. The die, mandrel and container are assumed to be rigid bodies and the temperature change induced during extrusion is ignored. Under various extrusion conditions, the present numerical analysis investigates the damage distribution, the stress-strain distribution, the die load and profile of product at the exit. The relative influences of the friction factors, pressure velocity of die, the temperature of billet and the thickness of seamless tube are systematically examined. The simulation results confirm the suitability of the current finite element software for forming of titanium alloy using indirect extrusion processes of seamless tube.

Key words: Finite element;Titanium alloy;
Indirect extrusion of seamless tube